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AVIAN INFLUENZA: AN OBSTACLE TO POULTRY DEVELOPMENT.

Otuma, M. O and Uchewa, E. N.
Department of Animal science, Ebonyi State University, P. M. B. 053.
Abakaliki Nigeria.

ABSTRACT
Viral infections replicate in millions so as to out number the antibodies of the host and cause great harm to eventually result to death. More in general, the bird flu outbreaks can be considered as part of the process of global change. Traffic and trade dynamics create conditions for viruses, bacteria and parasites to hitch hike around the world affecting people, animals and ecosystems. Consequently, the best approach to ameliorate the present situation is to maintain good hygienic practices (bio-security), which are the first line of the defense and attack against epidemics of bird flu. All persons working with poultry should avoid bringing in virus (bio-exclusion) and prevent virus existing (bio-containment) if it has already entered a flock, region or village. Avian influenza virus like moist and dirty conditions (where it can get attenuated fast and explode). However, the use of detergents is of paramount importance because the virus is simpler to destroy than many viruses since it is very sensitive to detergents, which destroy the fat containing outer layer of the virus.

Key words: Avian influenza, Virus, Epidemics, Hygiene, Poultry and Breeds.

INTRODUCTION

Nigeria has the biggest national poultry population in Africa. It is estimated to be 104 million (Federal Livestock Department, 1992) of which only a 10^{th} is of exotic breeds kept in commercial farms, mostly around cities in the Southern parts, and as smaller flocks throughout the country. The rest constitutes village chickens of local breeds kept as free roaming and in backyards. Others are scattered populations and typically are non-descript in type because of indiscriminate inter-breeding (Sonaiya *et al.*,1999), although they are hardy and well adapted to their local environment. To date, the best estimate of the poultry population in Nigeria is the one obtained during the National Livestock Census undertaken in 1992 (Federal Department of Livestock, 1992). Table 1 summarizes the results of the survey.

However, the emergence of the avian flu can be a great obstacle to this poultry population as stated above. The Avian Influenza (AI) is an infectious viral respiratory disease of birds caused by type "A" subtype of the influenza virus (Menn *et al.* 2005). It was originally termed "fowl plague" and recognized as an infectious disease of birds in chickens in Italy 1878 by Perroncito. Due to a former hot spot in the Italian Upper Po Valley, it was also referred to as "Lombardian disease". Although Centanni and Savonuzzi, in 1901 identified a filterable agent responsible for causing the disease, it was not before 1955 that Schafer characterized these agents as influenza A viruses (Brahmbhatt, 2005). The aim of this review therefore is to increase farmers knowledge of the epidemic, mode of transmission and its preventive measures.

EPIDEMIOLOGY

The flu virus appears naturally among birds. Wild migratory aquatic birds such as ducks, geese, gulls and shorebirds are natural carriers of the virus, but are resistant to severe infection from the virus. They are carriers of the full variety of influenza virus A subtypes and thus most probably constitute the natural reservoirs of all influenza A virus (Alice and Edler 2006). While all bird species are thought to be susceptible, some domestic poultry species-chickens, turkey, guinea fowl, quail and pheasants are known to be especially vulnerable to the sequence of infection and can cause very sever consequences.

Avian influenza A viruses generally do not cause disease in their natural hosts. Instead, the viruses remain in an evolutionary stasis i.e. the host and virus seems to exist in a state of a meticulously balanced mutual tolerance, clinically demonstrated by absence of disease but in efficient viral replications (FAO, 2006).

AETIOLOGY

Avian Influenza Virus (AIV) is a member of the Orthomyxoviridae family. Genus Influenza Virus type A. They are classified as types A, B, and C. The influenza A virus genome comprises eight negative-sense RNA segments. These segments encode ten proteins, two of which are glycoprotein- hemagglutin (HA) and neuraminidase (NA).

H5NI is a subtype of the Influenza A virus, with the H5 and N1 subtypes. Subtypes of the influenza A virus are designated as HXNY where H stands for hemagltuinin and N stands for neuraminidase. X is a number that can be one of the 16 types of hemagglutinin and Y is a number that can be 1-9.

The most pathogenic subtypes of avian influenza in birds are H5NY of H7NY although both low pathogenic avian influenza (LPAI) and high pathogenic avian influenza (HPAI) exist for the same subtypes (C. Li. *et al.* 2005).

CLINICAL DIAGNOSIS

AI is diagnosed in human by isolating the virus from nasal secretions by testing methods.

VIRUS THAT CAN CAUSE HPAIV

Only virus of the H5 and H7 subtypes are known to cause the highly pathogenic form of disease. However, not all viruses of the H5 and H7 subtypes are highly pathogenic and not all will cause severe disease in poultry.

Presently, H5 and H7 are introduced to poultry flocks in their low pathogenic form. When allowed to circulate in poultry populations, the viruses can mutate, usually within a few months, into a highly pathogenic form. This is why the presence of an H5 and H7 viruses in poultry is always a cause for concern, even when the initial signs of infections are mild.

SYMPTOMS OF LPAIV IN BIRDS INCLUDE;

- Ruffled feathers.
- Transient reductions in egg production.
- Weight loss combined with a slight respiratory disease.

SYMPTOMS OF HPAIV IN BIRDS INCLUDE;

- In laying flocks, a cessation of egg production is apparent.
- Oedema, visible at feather-free parts of the head.
- Cyanosis of comb, wattles and legs.
- Greenish diarrhea.
- Emaciation.
- Sneezing.
- Laboured breathing.
- Coughing.
- Decreased feed intake.

Symptoms of highly pathogenic H5NI avian influenza in humans include;

- Fever,
- Cough,
- Sore throat,
- Muscle aches,
- Eye infections (Conjunctivitis),

- Pneumonia,
- Severe respiratory diseases such as acute respiratory distress.

The severity of the infection will depend to a large part on the state of the infected person's immune system and if the victim has been exposed to the strain before.

Affected systems of Tracts in humans are:
- Respiratory
- Urogenital
- Nervous
- Digestive

Incubation period: for birds: 3-7 days; humans: 2-17 days
Diffusion rate - Rapid

Effects on production
- High mortality.
- Egg drop.
- Retarded growth.
- Chronic Respiratory Disease (CRD).

MODE OF TRANSMISSION
Avian influenza is transmitted by contact with infected birds or surface contaminated with nasal secretions or excretions from infected birds.

- To poultry – exposure of poultry to infected water fowl.
- Within a flock- bird to bird by direct contact.
- Farm to farm- movement of infected poultry, equipment and people.

Infected birds transmit H5NI through their saliva, nasal secretions, feaces and blood. Other species of animals may become infected with the virus through direct contact with these bodily fluids or through contact with surfaces contaminated with them. H5NI remains infectious after over 30 days at 0^0C (32.0^0F) i.e. over one month at freezing temperature or 6 days at 37^0C (98.6^0F) which is one week at human body temperature so at ordinary temperatures it will remain in the environment for weeks. Since migratory birds are among the carriers of the highly pathogenic H5N1 virus, it spreads to all parts of the world. H5N1 is different from all previously known highly pathogenic avian flu viruses because of its ability to be spread by animals other than poultry birds.

According to Webster and Walker, 2003, transmission in humans is by direct contact with infected poultry, or surfaces and objects contaminated by their feaces. This is presently considered the main route of human infection. To date, most human cases have occurred in rural or periurban areas where many households keep small poultry flocks, which often roam freely, sometimes entering homes or sharing outdoor areas where children use for recreations. As infected birds shed large quantities of virus in their feaces, opportunities for exposure to infected droppings or to the environments contaminated by the virus are abundant under such conditions (FAO, 2004). Moreover, because many households in Asia depend on poultry for income and food, many families sell or slaughter and consume birds when signs of illness appear in a flock, and this practice has proved difficult to change. Exposure is considered most likely during slaughter, defeathering, butchering and preparation of poultry for cooking.

However, transmission in humans requires very close contact with an ill person.
The strains without asterisk are in the low pathogenic form. In most cases, it causes minor sickness or no noticeable signs of diseases in birds. It is not known to affect humans at all. The only concern about it is that, it is possible for it to be transmitted to poultry and in poultry may become lethal and mutate into a highly pathogenic form.

ENVIRONMENTAL SURVIVAL OF AVIAN FLU

Avian flu virus can last indefinitely at a temperature dozens of degrees below freezing point, as is found in the northern most areas of Asia where migratory birds frequent (Jennifer, *et. al*. 2004).

Influenza A viruses can survive:

- On clothes, paper and tissues for 8-12 hours.
- On hard non-porous surface such as plastic or stainless steel for 24-48 hours.
- Decades in permanently frozen lakes.
- 6 days at 37^0C (98.6^0F) i.e. one week at human body temperature.
- Over 30 days at 0^0C (32.0^0F) i.e. over one month at freezing temperature.

Inactivation of the virus occurs under the following conditions:

- Exposure to disinfectants e.g. formalin, iodine compounds.
- Acidic conditions pH less than 0.05.
- Presence of oxidizing agents such as sodium dodecyl sulfate, lipid solvents, etc.
- Ordinary levels of chlorine in tap water kill H5N1 in public water systems.
- Heat inactivates H5N1 i.e. the virus therefore, while cooking poultry to 70^0C (158^0F) kills the H5N1 virus, it is recommended to cook meat to 165^0F to kill all food borne pathogens.

Generally, to kill avian flu virus, the "World Health organization recommends that environmental surfaces by cleaned by the following;

- Bleaching powder 7g/Litre with 70% available chlorine for toilets and bathrooms.
- 70% alcohol for smooth surfaces, Table tops, and other surfaces where bleach cannot be used.
- Disinfectants such as sodium hypochloride, 1% in use dilution, 5% Solution to be diluted 1:5 in clean water, for materials contaminated with blood and body fluids.

PRESENT SITUATION IN NIGERIA

In December, 2005, before the emergence of HPAI into Nigeria in February, 2006, the Federal Livestock Department of Nigeria (FDL) constituted a Technical Committee of experts on the prevention and control of HPAI in Nigeria. The committee was mandated to map out strategies for prevention, disease surveillance, networking and contingency plan for an HPAI emergency in Nigeria (Federal Department of Livestock 2005). The Committee also suggested the risk factors that could facilitate the emergence of the disease into the country to include;

a) Through migratory birds,
b) Presence of HPAI in Southeast Asia and South Africa and increased trade as well as human traffic with Nigeria,
c) Nigeria's long and porous borders and informal livestock moment/trading across the borders, especially at border markets.
d) Smuggling/illegal movement of poultry and poultry products into Nigeria from infected countries and
e) Inadequate veterinary quarantine facilities and manpower.

Unfortunately, before the full implementation of the committee's plan, the disease was reported for the first time in Nigeria. The first outbreak occurred in a commercial poultry layer farm in Jaji, Kaduna State, where ostriches and geese were also kept. About 50,000 birds were affected. It is still unclear if the outbreak has been triggered by migratory birds or by the trade and movement of poultry or poultry products. Subsequent outbreaks happened in farms in Plateau, Katsina, Kano States and the Federal Capital Territory and so many other unconfirmed farms.

Daily Trust Newspaper reported on 21st February (2008), that poultry farmers in Kebbi state have been warned on dangers of absence of bio-security facilities in their farms which could cause outbreak if avian influenza. A survey conducted by an avian influenza control project team in the state showed that most of the poultry farms visited were either lacking proper bio-security or it is completely absent. However, bio-security entails proper sheltered, periodic checks by qualified veterinary doctors and separation of new birds from old ones. In maintaining a healthy poultry farm, these modern facilities must be provided, otherwise the birds could be prone to diseases (Ito, 2001).

Risk factors abound in Nigeria that could facilitate the spread and continued presence of HPAI in the country. Some of the identified factors are;

(a) Presence of wet lands where free flying wild birds and domestic ducks visit and rest, which could be the source of the recent emergence of the disease into the country.
(b) Sale and consumption of sick and dead birds.
(c) Improper disposal facilities for poultry carcasses.
(d) Lack of funding for compensation of livestock/flock owners in the event of slaughter of their animals for purposes of disease control.
(e) Difficulties in the clinical differentiation of HPAI from other epidemic poultry diseases like Newcastle disease, fowl cholera, Mycoplasmosis, etc.
(f) Inadequate earl warning and early reaction capabilities including inadequate experience of most animal health workers in the recognition and diagnosis of HPAI.
(g) The rearing together of poultry flocks of different species and different ages.
(h) Lack of registration and licensing of poultry farms/hatcheries and the related establishments as provided by the law.
(i) Lack of organized poultry marketing and existence of open live markets characterized by interspecies mixing and poor sanitary conditions.
(j) Uncontrolled livestock and poultry movement within the country as a result of lack of enforcement of animal disease control laws and regulations in the country..
(k) Structure of poultry industry in Nigeria consisting predominantly of family poultry with little or no bio-security, and peri-urban commercial poultry production with minimum to moderate bio-security and constant introduction of new birds from relatively unknown and unverifiable sources.

CONTROL OR PREVENTIVE MEASURES

Avian Influenza is a viral disease and no cure has been made except the death of the host. You have to kill the host, burn and bury it. However, some control measures have been carried out generally to prevent lateral spread to other farms or areas. Such measures include;

(1) Quarantining of infected and contact farms.
(2) It is pivotal that movement of live poultry and also possibly, poultry products, both within and between countries are restricted during outbreaks.
(3) Rapid culling of all infected or exposed birds.
(4) Proper disposal of carcasses.
(5) Testing and culling of acutely infected holdings with H5 and H7 subtypes of LPAI in poultry so as to reduce the risk of a de novo development of HPAIV.
(6) For sanitary reasons, wash your hands after handling any poultry.

Specific problems of this eradication or control measures may arises areas;

(i) With a high density of poultry populations
(ii) Where small backyard holdings of free roaming poultry prevail.

Due to the close proximity of poultry holding and intertwining structures of the industry, spread of the disease is faster than eradication or control measures (FAO 2003).

ROLE OF VACCINES

Two drugs (in the neuraminidase inhibitor class), oseltamivir (commercially known as Tami flu) and Zanamivir (commercially known as Relenza) can reduce the severity and duration of illness caused by seasonal influenza (Timm, *et al;* 2006). In other words, can sometimes inhibit the influenza virus from spreading inside the user's body.

As regards to the drugs, WHO says that Tami flu's real effectiveness remains unsure. As for a vaccine, work cannot start on it until the emergence of a new virus, and will take six to nine months to develop it. Therefore for the moment, they cannot by any means count on a potential vaccine to prevent the spread of a contagious influenza virus whose various precedents in the past 90 years have been highly pathogenic. Then Nigeria in 2006, the government under President Olusegun Obasanjo had handled the outbreak very well by banning the importation of poultry products into the country. If not, Nigeria would have been a dumping ground for avian flu infected products.

Other measures undertaken include; stamping out, quarantine, disinfection of infected premises/establishments and movement control inside the country.

ECONOMIC CONSEQUENCES

Outbreaks of highly pathogenic avian influenza can be catastrophic for single farmers and for the poultry industry of an affected region as a whole. Economical losses are usually only partly due to the direct deaths of poultry from HPAI infection (Brahmbhatt, 2005). Measures put to prevent further spread of the disease leaves a heavy toll. Nutritional consequences have been devastating in developing countries where poultry is an important sources of animal and human protein. Once outbreaks have become widespread, control is difficult to achieve and may take several years (WHO 2005, WHO 2006).

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Table 1: National Poultry Population Estimates, Nigeria

Species	Rural area	Urban	Total
Chickens	68,244,195	4,156,161	72,400,856
Ducks	11,220,461	573,507	11,793,968
Guinea fowls	4,621,670	58,237	4,679,907
Pigeons	13,566,775	1,593,091	15,159,866
Turkeys	207,219	16,144	223,363
All Poultry	97,860,320	6,397,640	104,257,960

Source: Federal Livestock Department, Nigeria, (1992).

Table 2: Documental Human Infections with A.I. Viruses

Date	Country/Area	Strain	Cases (Deaths)	Symptoms	Source
1959	USA	H7H7**	1	Respiratory	Overseas travel
1995	UK	H7H7	1	Conjunctivitis	Pet ducks (shared lake with migratory birds)
1997	Hong Kong	H5N1**	18(6)	Respiratory/pneumonia	Poultry
1998	China (Guangdong)	H9N2	5	Unknown	Unknown
1999	Hong Kong	H9N2	2	Respiratory	Poultry, Unknown
Feb 2003	Hong Kong	H5N1**	2(1)	respiratory	Unknown
Mar. 2003	Netherlands	H7N7**	89(1)	Conjunctivitis (Pneumonia, respiratory in-sufficiency in fatal case)	Poultry
Dec.2003	Hong Kong	H9N2	1	Respiratory	Unknown
2003	New York	H7N2	1	Respiratory	Unknown
2003	Vietnam	H5N1**	3(3)	Respiratory	Poultry
2004	Vietnam	H5N1**	29(20)	Respiratory	Poultry
2004	Vietnam	H5N1**	17(12)	Respiratory	Poultry
2004	Canada	H7N3**	2	Conjunctivitis	Poultry
2005	Vietnam	H5N1**	61(19)	Respiratory	Poultry
2005	Thailand	H5N1**	5(2)	Respiratory	Poultry
2005	China	H5N1**	7(3)	Respiratory	Poultry
2005	Cambodia	H5N1**	4(4)	Respiratory	Poultry
2005	Indonesia	H5N1**	16(11)	Respiratory	Poultry
2006	Turkey	H5N1**	3(3)	Respiratory	Poultry

Source: WHO, (2006).

** Highly pathogenic for poultry.

The strains without asterisk are in low pathogenic form. In most cases, it causes minor sickness or no noticeable signs of diseases in birds. It is known to affect humans at all. The only concern about it is that, it is possible for it to be transmitted to poultry may become lethal and mutate into a high pathogenic form.

Table 3:
Confirmed human cases and mortality rate of avian influenza (H5N1) As of February 28, 2008.

Country	Total	2003			2004			2005			2006			2007			2008		
	Report dates																		
	Cases	Deaths	Percentage	Cases	Deaths	Percentage	Cases	Deaths	Percentage	Cases	Deaths	Percentage	Cases	Deaths	Percentage	Cases	Deaths	Percentage	Cases	Deaths	Percentage
Azerbaijan										8	5	63%							8	5	63%
Cambodia							4	4	100%	2	2	100%	1	1	100				7	7	100%
PR China	1	1	100%				8	5	63%	13	8	62%	5	3	60%	3	3	100%	30	20	67%
Djibouti										1	0	0%							1	0	0%
Egypt										18	10	56%	25	9	36%	1	0	0%	44	19	43%
Indonesia							20	13	65%	55	45	82%	42	37	88%	12	10	83%	129	105	81%
Iraq										3	2	67%							3	2	67%
Laos													2	2	100%						
Myanmar													1	0	0%						
Nigeria													1	1	100%						
Pakistan													1	1	100%						
Thailand					17	12	71%	5	2	40%	3	3	100%	25	17	68%						
Turkey										12	4	33%							12	4	33%
Vietnam		3	3	100%	29	20	69%	61	19	31%				8	5	63%	4	4	100%	105	51	49%

Source: World Health Organization Communicable Disease Surveillance and Response (CSR) (http://www.who.int/csr/disease/avianinfluenza/country/en).

Table 4

	Key	Form and final concentration	Contact time and notes
1.	Soaps and detergents		Leave in contact. 10 minutes
2.	Oxidizing agents		
2a.	Sodium hypochlorite	Liquid, dilute to final 2-3% Available chlorine (20g/litre Powder, 30g/L solid	Not good for organic materials. 10-30 minutes contact
3.	Alkalis		
3a.	Sodium hydroxide (caustic soda) NaOH) do not use with aluminum And like alloys.	2% (-20g/Litre)	10 minutes. Do not use in presence of Aluminum
3b.	Sodium carbonate anhydrous (Washing soda) $NaCO_3$ $10H_2O$	4% (=40g/Litre) from powder 100g/L from crystals	10 minutes. Recommended for use in presence of organic materials as above 30 minutes
4.	Acids		
4a.	Hydrochloric	2% (20ml/litre)	Corrosive, use only when better not available
4b.	Citric	0.2% (2g/litre)	30 minutes, safe for clothes and body decontamination.
5.	Formaldehyde gas	Special generation required	15-24hrs. Toxic, only if others cannot be used.

Source: AUSVETPLAN Operational Procedures Manual, Decontamination-http://www.aahc.com.au/ausvetplan/decfnl2.pdf)

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Corresponding Author:
Uchewa, E. N.
Department of Animal science, Ebonyi State University, P. M. B. 053.
Abakaliki Nigeria.
Email: euchewa@yahoo.co.uk